SECTION 8.4
ROCK SANDWICH

8.4.1 DESCRIPTION

The rock sandwich is a specialized road base design under a road that consisting of coarse rock wrapped in fabric through which water can freely pass and be discharge as sheet flow on the downgradient side of the road. It is designed to be used in wetlands to pass surface water and in road cuts and fills where the cut extends below the seasonal groundwater table in soils which groundwater seeps seasonally. It may be as narrow as a few feet or over several hundred feet. A rock sandwich is unlike a culvert in that it does not concentrate water to a single entry and exit point but spread the water out over a distance equal to the with of the wetland or intercepted groundwater thereby reconnecting the natural hydrology. It is not designed to be used in concentrated flow areas or to handle just runoff water. Groundwater has enough latent heat to prevent a rock sandwich from freezing. It can be used in conjunction with a culvert if the wetland has concentrated flow channels or if the road cut is below seeping groundwater.

The benefits of a rock sandwich are:

- They reconnect intercepted hydrology in a much more natural manner than culverts.
- When dispersed to a vegetated buffer, they assist in the treatment of road runoff by non-structural methods avoiding the need for costly and time consuming installation and maintenance of structural measures.
- They require little maintenance compared to cross-culverts.
- They have a wide discharge area that does not concentrate flows which can scour soil similar to a culvert.
- The significantly strengthen the road base on soft soils.
- They prevent groundwater from wicking up into the road fill material thereby minimizing the potential for frost action and potholing.
- They provide an indefinite service life compared to a cross-culvert.

8.4.2 SITE SUITABILITY

The primary function of a rock sandwich is to allow intercepted surface and/or groundwater to pass from one side of the road to the other over the entire width in which it is intercepted. Sites where the rock sandwich are most useful are for wetland crossings and for sections of road where cuts are made below the seasonal groundwater table where there is a large contributing watershed and the soils are medium to coarse textured so that there is a significant amount of groundwater passing through them. Commonly, the groundwater in these soils is oxygenated so they are not considered wetlands even though they have a high seasonal groundwater table.

8.4.3 GENERAL DESIGN CRITERIA

The rock sandwich consists of 3” – 6” stone “sandwiched” between layers of permeable filter fabric through which water can freely pass from one side of the road to the other as

sheet flow. Both ends of the stone sandwich are exposed so that water can enter and pass through it unimpeded.
A rock sandwich should be used in areas of:
Non-concentrated flows: areas where concentrated flows from a pipe may be undesirable, impractical, or regulated.
Road impoundment: In areas where a road is acting as an impoundment or dam to the natural water flow by isolating subsurface water on one side of the road from the other.
Shallow bedrock depth: Areas where placement of a pipe at the depth necessary to provide structural cover would lower the natural water table of the area and require long term maintenance.
Wetland crossing: Low-lying areas near streams or wetlands where maintaining sheet flow would be difficult.
Road load bearing: A filter fabric and rock layer in the lower portion of a road provides bearing strength. The water collects in the voids provided by the larger rock and moves away by gravity rather than softening the subbase soils.

8.4.4 SPECIFIC DESIGN CRITERIA

Site Preparation: To minimize the alteration of wetlands, do not stump and grub wetland surfaces under the road footprint. Cut trees close the ground, leaving the stumps in place which will provide added structural support to the rock sandwich. This woody debris will not decompose as it will be anaerobic. The intact soil surface is less of a threat to move and plug up the rock sandwich material. In cut and fill roads, minimize ground disturbance and avoid excavating ditches!
Bottom geotextile: After the site has been prepared, place a permeable woven/non-woven filter fabric over the length of roadway with a rock sandwich. Filter fabric "joints" should overlap by at least 18".
Material: the core material of a rock sandwich is a minimum of 12" thick layer of clean 3"-6" diameter stone on the fabric for the full width of the roadway.
Top geotextile: Place permeable, non-woven filter fabric on top of the entire length of rock layer. Do not cover the upgradient and downgradient sides of the rock layer with filter fabric or soil. Leave these areas exposed so that surface water from the upslope part of the wetland can pass unimpeded to the downslope part of the wetland.
Upgradient soil disturbance: If inadvertent soil disturbance has occurred on the upslope side of the rock sandwich, place stone on the disturbed soil so that it will not migrate to the ends of the rock sandwich and plug it up.
Road fill and road base: Place additional road fill as designed and the driving surface material over the top filter fabric according to specifications and procedures (minimum of 6" recommended after compaction).
Upgradient of cut slopes: Place 3"-6" thick layer of rock sandwich stone on cut face up to the height of seeps. This allows for seepage to reach the rock sandwich in the roadbed but holds the soil in place.
Downgradient of fill slopes: Do not cover the downslope edge of the rock sandwich stone with geotextile so that water can freely be diffused back into sheet flow and that the slope is protected.
Culverts in Rock Sandwich: If the crossing has a stream, a defined drainage way or larger concentrated flows are anticipated, a culvert should be installed according to

appropriate design standards. The culvert should be installed where its invert is at least 3” above the elevation of the bottom of the rock sandwich to assure that the rock sandwich passes base flows and the culvert is only used for high runoff flows.

8.4.4 MAINTENANCE

Check upslope face of stone layer to prevent clogging by eroded soil, road sand, debris and leaf litter.